

TRANSFER OF *PETROPHILA DRUMALIS* (DYAR) TO *ARGYRACTIS*
BASED ON IMMATURE AND ADULT CHARACTERS WITH A LARVAL
DESCRIPTION OF *ARGYRACTIS SUBORNATA* (HAMPSON)
(LEPIDOPTERA: CRAMBIDAE: NYMPHULINAE)

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Abstract.—*Petrophila drumalis* (Dyar) is transferred to *Argyractis*, new combination. *P. drumalis* was found to be more closely related to *A. subornata* (Hampson) than to other species presently in *Petrophila* on the basis of biology and morphology of the larvae. The larvae of both species share the presence of ventral tubercles on the metathorax and abdominal segments 1-10 which has not been reported in any other nymphuline. A description and illustrations of the larva and adult genitalia of *Argyractis subornata* (Hampson) are provided. The distribution and usefulness of some adult characters previously used to define genera are discussed.

Key Words: Waterlettuce, *Pistia stratiotes*, aquatic caterpillar, Pyralidae, water hyacinth, *Eichhornia crassipes*

INTRODUCTION

Petrophila drumalis (Dyar) is a species endemic to Florida (Munroe 1972). The larvae have been found feeding on water-lettuce (*Pistia stratiotes* L.) and waterlilies (*Nymphaea* spp.). Dray et al. (1989) described the immature stages of *P. drumalis* and pointed out the similarity of the larval habits to those of *Argyractis subornata* (Hampson), a species found only in Brazil. *Argyractis subornata* had been found feeding on the root hairs of water hyacinths (*Eichhornia crassipes* (Martius) Solms-Laubach) (Forno 1983). Dray et al. (1989) also briefly contrasted the habits of other known *Petrophila* species with those of *P. drumalis* and *A. subornata*. Our purpose is to test the hypothesis that *P. drumalis* is more closely related to *A. subornata* than to other species in *Petrophila* Guilding.

Because the generic placement of *P. dru-*

malis was in doubt and because the first author was preparing a key to the larvae of North American nymphuline genera (Habeck, in press), there was a need to study the morphology of the adults and larvae of *A. subornata*. Therefore, we compared adults and where available, immatures of *P. drumalis* and *A. subornata* with each other and with other members of *Petrophila* and *Argyractis*.

Almost all previous taxonomic work in the Nymphulinae is based on adult morphology. Hampson (1897) described the genus *Argyractis* and the type species, *argentinae*, from Espiritu Santo, Brazil; and he described *subornata* in *Cataclysta* Hübner from São Paulo, Brazil. After studying more material from Asia, Africa, and tropical America he greatly expanded his concept of *Argyractis* and transferred *subornata*, among other species, to *Argyractis* (Hampson 1906).

Dyar (1906) described *Elophila drumalis* based on one female from Fort Drum, Florida. Subsequently, *drumalis* was transferred from *Elophila* Hübner to *Cataclysta* by Barnes & McDunnough (1917), to *Parargyractis* Lange by Lange (1956), and most recently to *Petrophila* by Munroe (1983).

Lange (1956), who studied a large number of neotropical nymphuline species and placed *subornata* in *Argyractis* and *drumalis* in *Parargyractis*, believed *Parargyractis* [= *Petrophila* sensu Munroe 1972] was closely related to an "Argyractis type." But according to Munroe (in press), all species except *A. argentilinealis* are misplaced in *Argyractis*, and the rest of the species need new generic placement. Evidently a much wider taxonomic problem exists requiring revision of a number of genera in the Nymphulinae, using both adult and immature characters, which is beyond the scope of this paper.

MATERIALS AND METHODS

The following adult material was studied: *Petrophila: drumalis* (Dyar), *cappsi* (Lange), *bifascialis* (Robinson), *confusalis* (Walker), *avernalis* (Grote), *longipennis* (Hampson). *Argyractis: argentilinealis* Hampson, *dodalis* Schaus, *berthalis* Schaus, *isasusalis* (Walker), *subornata* (Hampson). The type specimens of these species were studied at the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM) and The Natural History Museum, London, England (BMNH).

The following larval material was studied: Fifteen *Argyractis subornata* collected 4-X-1981 on *Eichhornia crassipes* by I. W. Forno at Praia de Leste, Brazil, *Petrophila drumalis* (Dyar), *Petrophila fulicalis* (Clemens), *P. santafealis* (Heppner), and unidentified *Petrophila* spp. from Oregon, U.S.A. and Honduras.

REVIEW AND RESULTS

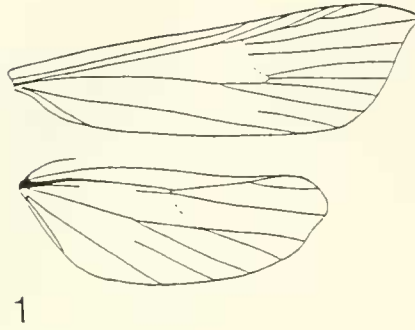
There has never been a study to document the distribution of adult and larval characters and states within the Nymphu-

linae and its relatives, therefore, the polarity of many characters and their significance at various taxonomic levels is unknown. As a result, we review the distributions of some generic characters as proposed in previous faunal studies and compare them to those of *A. subornata*, *P. drumalis*, and other species in *Petrophila* and *Argyractis*.

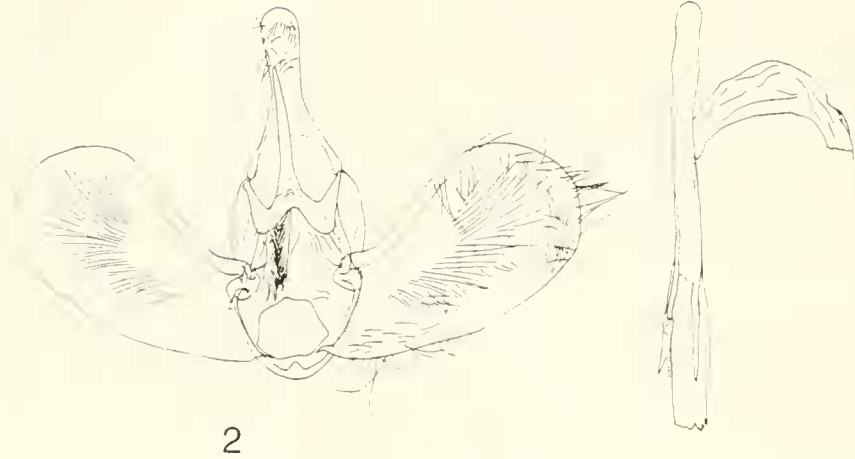
The current taxonomy of the Nymphulinae and most Lepidoptera is based on adult characters, but due to the lack of comprehensive studies of these characters their usefulness can only be surmised. For example, Heppner (1976) stated that *P. drumalis* differed from other species of *Petrophila* in having 3 subterminal black spots on the hindwing (see Figs. 1-6 in Heppner 1976). We found *A. subornata* also has 3 subterminal spots, although in some specimens they appear as a single line. *A. argentilinealis*, the type species, has at least 5 subterminal spots and other species presently in *Argyractis* lack the 3 subterminal spots. Further study may show that the presence of the 3 subterminal spots is a synapomorphy for *A. subornata* and *P. drumalis*.

Lange (1956) and Heppner (1976) used many characters to define genera that overlap with other taxa in the Nymphulinae. For example, Lange (1956), Munroe (1972), and Heppner (1976) stated that a distinguishing characteristic of adult *Petrophila* is a closed cell of the hindwing that is more than half the hindwing length. Study of a wing slide preparation (BMNH wing slide #18720) by Lange (1956) of the type specimen of *A. argentilinealis* (Fig. 1) shows that the forewing cell is about half the hindwing length. We found *P. drumalis*, *A. subornata*, and other species in *Argyractis* also have a cell over half the hindwing length. Therefore, this character will not be useful in defining *Petrophila* or other genera investigated in this study.

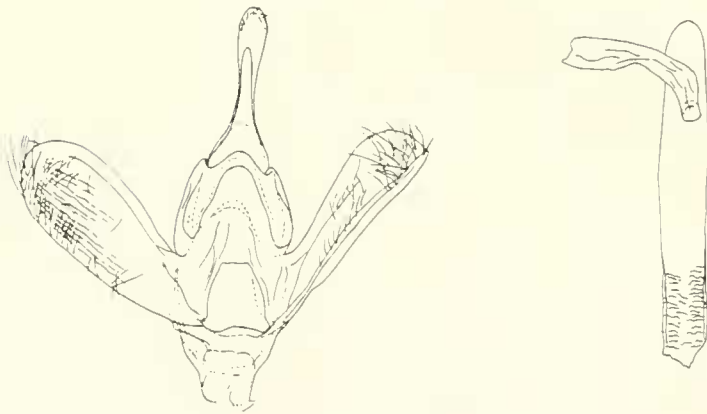
The polarity of most characters cannot be ascertained, i.e. which state is primitive and which is/are derived, because the distribution of many characters within the Nymphulinae and outside the Nymphulinae has



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Figs. 1-3. 1, Forewing and hindwing of *A. argentilinealis* (from Lange 1956). 2, Male genitalia of *P. santefealis* (Heppner) (from Heppner 1976). 3, Male genitalia of *P. drumalis* (Dyar) (from Heppner 1976).

not been documented. For example, the placement and form of the gnathos arms of the male genitalia. In all species examined of *Petrophila*, except *P. drumalis*, the distal end of the gnathos arms are posterior to the junction of the gnathos, tegumen, and uncus (Fig. 2). In *P. drumalis* (Fig. 3) the distal end of the gnathos arms is parallel to the distal end of the uncus arms at the junction of the gnathos, tegumen, and uncus, as in *A. argentilinealis* (Fig. 4), *A. subornata* (Fig. 5), and some other species presently assigned to *Argyractis*. E. Munroe (pers. comm.) offers the opinion that the "*Argyractis* type" of male genitalia "is a frequent and no doubt primitive condition in the Nymphulinae and related subfamilies and therefore is of doubtful value in defining *Argyractis*." A study documenting the distribution of these characters is necessary, and the more interesting observations will be, for example, the distribution of the derived "non-*Argyractis* type" of male genitalia and other states within the Nymphulinae and their usefulness in defining taxa.

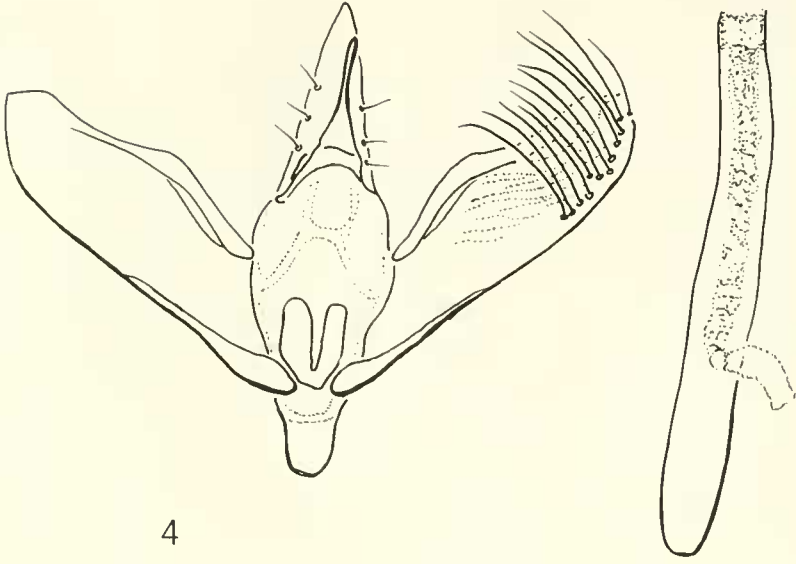
In an effort to find useful generic characters various authors (Lange 1956a, Heppner 1976) have previously described for many species the corpus bursae of the female genitalia, but not that of *A. subornata* which is illustrated here (Fig. 6). But as Lange (1956a, 1956b) pointed out, there is much species variation at the base of the ductus bursae and in the signa of the corpus bursae. We confirmed Lange's finding that in *Petrophila* (Fig. 8) the signa are absent or occur as large spines in various number; but the signa present in *P. drumalis* and *A. subornata* (Figs. 6, 7) are scobinate although not strongly so in *P. drumalis*. The type of *P. drumalis* lacks an abdomen, but Lange had identified and dissected a female from Florida (U-142 = USNM genitalia slide #99121). Freshly caught material from Florida was also dissected. Munroe (1972) erroneously stated that the corpus bursae of *P. drumalis* was "globular and membra-

Table 1. Comparison of *Petrophila*, and *drumalis* and *subornata* larvae.

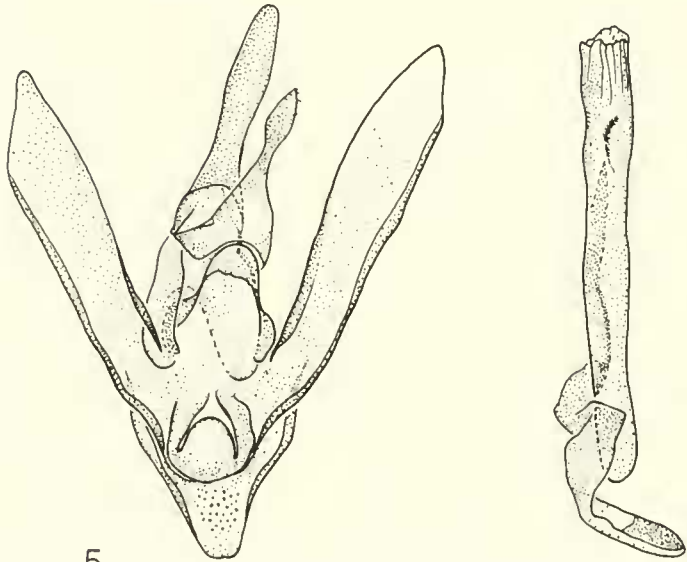
Characteristic	<i>Petrophila</i>	<i>drumalis</i> and <i>subornata</i>
Habitat	under silk webs on rocks in fast moving water; lakes, stagnant water, and hot springs (Lange 1956a)	in shelters on roots in slow-mov- ing water
Food	periphyton	roots
Body	flattened dorso- ventrally	eruciform
Head Gills	prognathous on lateral margin	hypognathous mid-dorsal to subventral
Ventral tubercles	absent	present
Coxae	widely separated	contiguous or close to- gether
Proleg sclerotized ring	present	absent
Crochets	circle	penellipse

nous" (Fig. 7) and was figured as such by Heppner (1976). In *A. argentilinealis*, the type species, the corpus bursae is scobinate, but the ductus bursae has spines (Fig. 9) and in this respect resembling the condition in some *Petrophila* species. The female genitalia provide defining characters at the species level, but probably not at the generic level.

Very few neotropical nymphuline larvae have been described, and no comparative work has been done that includes species from both hemispheres. Dray et al. (1989) described and provided photographs of *P. drumalis*, and compared it with *A. subornata*. In Table 1 we provide a comparison of the habitat and larval morphology of *Petrophila* with those of *A. subornata* and *P. drumalis*. The presence of ventral tubercles is a synapomorphy that strongly supports a close relationship between *A. subornata* and *P. drumalis* because they are not present in other representatives of *Petrophila* or any other known nymphuline.



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Figs. 4, 5. 4, Male genitalia of *A. argentilinealis* Hampson (from Lange 1956). 5, Male genitalia of *A. subornata* (Hampson).



Fig. 6. Female genitalia of *A. subornata* (Hampson).

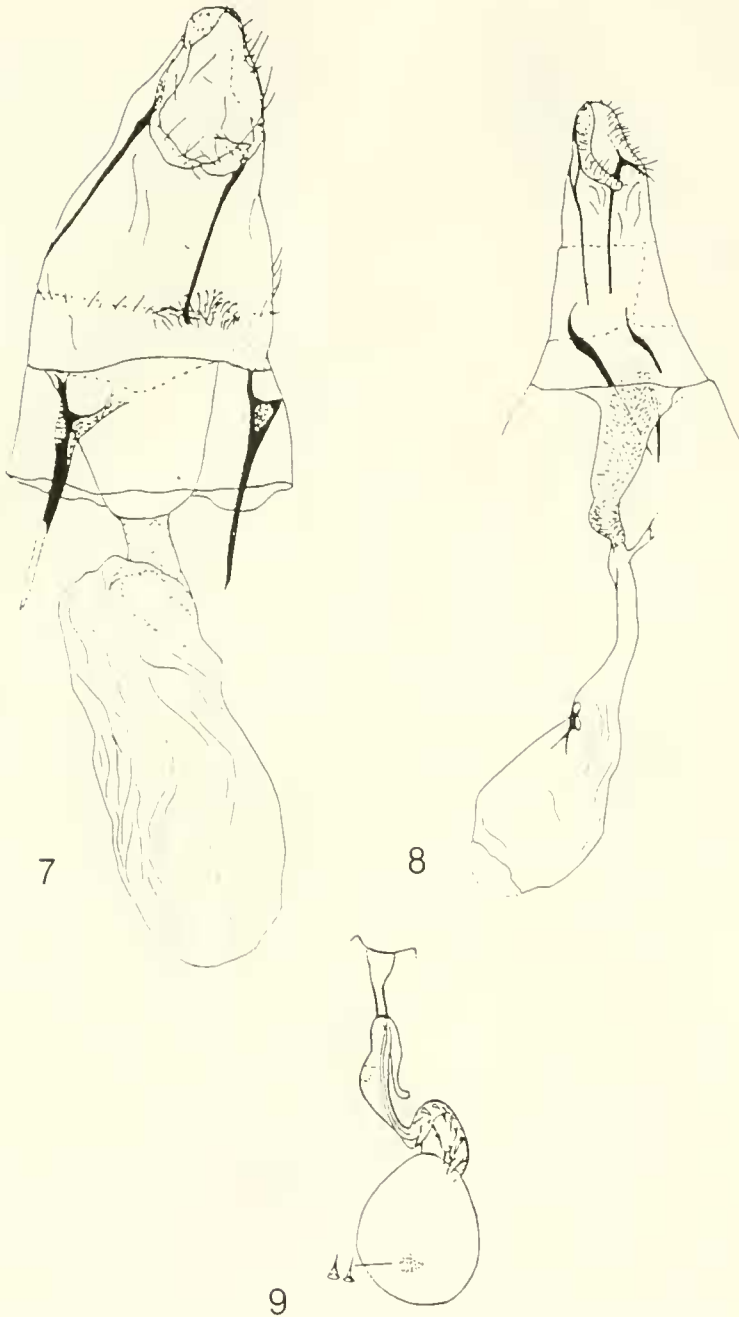
LARVAL DESCRIPTION

Because the larva of *A. subornata* has not been described, we provide figures (Figs. 10–16) and the following description: Maximum length about 15 mm. Body eruciform, not flattened dorsoventrally; creamy pale to light brown, unicolorous, except for brown

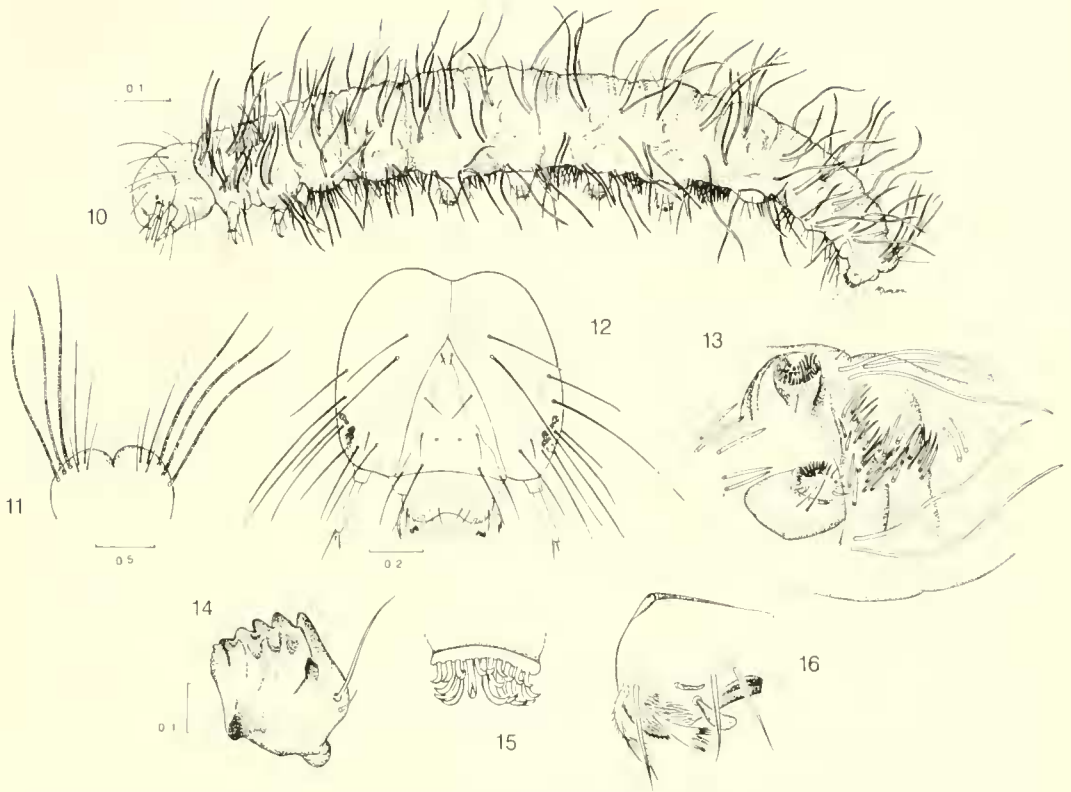
to dark brown claws on thoracic legs and crochets. Unbranched filamentous gills present on meso- and metathorax and abdominal segments 1–10. Gills generally as long or longer than body diameter. Metathorax and abdominal segments 1–10 with mid-ventral elongate, pointed tubercles. Tubercles particularly abundant (50+) in the intersegmental areas between prolegs.

Head: Hypognathous; yellowish brown with 2 short irregular darker brown longitudinal bands or variable spots between the stemmata and the epicranial suture. Frontoclypeal area extending $\frac{2}{3}$ distance to vertex. Labrum with a shallow obtuse notch; setae M1, M2, and L1 normal; seta M3 spatulate; seta L2 broadly brushlike; seta L3 narrowly brushlike. Mandible with four apical teeth and four inconspicuous inner ridges and a smaller tooth near the two mandibular setae, one of which is much longer than the other. Spinneret short, pointed, slightly longer than labial palpus. Hypostomal lobes pointed mesially, nearly touching. Seta F1 at same level as F punctures; Setae P1 and A3 longest of head setae; A1, A2, and A3 almost in a straight line; A1 3 times as long as A2 and $\frac{2}{3}$ as long as A3; A1 and A2 close together; setae L1 and A3 as close together as P1 and P2; seta AF2 at or near apex of frons; seta P1 closer to P2 than to AF1. Six black stemmata, 1–4 with distinctly pigmented areas; 2–4 very close together. Terminal seta of antenna longer than antenna.

Thorax: Prothoracic shield poorly defined, but with several brownish spots arranged longitudinally about midway between ventral and dorsal margins; setae XD1, XD2, and SD1 equally spaced on front margin; SD2 dorsocaudad of SD1; seta D2 near posterior margin. Prothoracic spiracle vestigial. Lateral and subventral setal groups on prothorax bisetose. Lateral setae very fine. Prothorax protruding ventrally with legs projecting forward and modified for clasping stems. Prothoracic coxae broadly joined, mesothoracic coxae adjacent and



Figs. 7-9. 7, Female genitalia of *P. drumalis* (Dyar) (from Heppner 1976). 8, Female genitalia of *P. bifascialis* (Robinson) (from Heppner 1976). 9, Ductus and corpus bursae of *A. argentilinealis* Hampson (from Lange 1956a).



Figs. 10-16. Larva of *A. subornata* (Hampson). 10, Lateral aspect. 11, Anal plate. 12, Head, anterior aspect. 13, Sixth abdominal segment, ventral aspect, showing tubercles behind prolegs. 14, Mandible. 15, Crochets. 16, Right half of labrum.

metathoracic coxae slightly separated. D1 and D2 setae adjacent; SD1 prominent on T2 and T3. SV group bisetose on T1 and unisetose on T2 and T3. Lateral setae very fine and clustered together. T2 and T3 with 5 and 6 gill groups respectively, one anterior to lateral setae, one adjacent to lateral setae, one posterior to SD1 and one associated with SV setae. SV gill group with 4-6 gills, all others with 1-3 gills. In addition, T2 with an anterior middorsal group and T3 has an anterior and posterior middorsal gill group.

Abdomen: Vestigial spiracles on A1-8; A1-7 each with 8 gill groups: anterior and posterior middorsal, subdorsal, lateral and subventral groups. A8 similar but with only 1 lateral group. A9 with 1 dorsal and 1 subventral group and A10 with only a subdorsal group. Most setae on abdomen incon-

spicuous. No sclerotized band around prolegs. Crochets in a uniserial, triordinal mesal penellipse. Anal shield inconspicuous, with a median posterior notch. Lateral margin of anal shield with gills. Four setae on anal shield in an irregular square with the 2 posterior setae, L1 and D2, slightly stouter. SV setal group unisetose on A1, bisetose on A2, A7-8, and trisetose on A3-6. V1 setae on inner side of prolegs. L group bisetose on A9. Most gill groups on abdomen with 2-4 gills.

CONCLUSIONS

This study shows that, based primarily on the larval morphology and habits, *P. drumalis* is more closely related to *A. subornata* than to other species in *Petrophila*. In contrast, the adults did not provide substantial

information, although the presence of 3 subterminal spots on the hindwing also suggest this relationship, the female genitalia did not appear to provide characters to define the genera. Nevertheless, we transfer *drumalis* to *Argyractis* to provide a better approximation of relationship. A generic study on a worldwide basis will probably show *P. drumalis* and *A. subornata* to be congeneric, but not with *A. argentilinealis*, the type species of *Argyractis*.

This brief study of adult and immature characters of a subset of the Nymphulinae suggests that the aquatic habits and larval morphology of nymphulines will probably provide more information about the genera and their relationships than adult characters. A comprehensive study of *Petrophila*, *Argyractis*, and related genera that includes the immature stages is necessary to better define the genera and species and their relationships. As a result, we found it premature to describe a new genus for *P. drumalis* and *A. subornata*.

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